NONWOVEN MATERIAL

Background

The present invention generally relates to nonwovens, and in particular, to nonwovens that are subsequently molded into an article, such as a headliner for automobiles.

Current processes for forming nonwovens with rigidity for subsequent articles, such as automobile headliners, uses fiberglass to get the necessary rigidity for the construction. However, the use of fiberglass requires special handling requirements. Therefore, there is a need for nonwoven materials which can eliminate fiberglass and provide the necessary construction rigidity for applications such as automotive headliners. In the past elimination of the fiberglass resulted in an increase of the nonwoven weight and raw material cost. Thus a need remains for nonwoven materials having high rigidity, reduced weight and raw materials, and the elimination of special handling requirements.

Brief Description Of The Drawings

For a more complete understanding of the present invention, reference should be made to the following drawings in conjunction with the detailed description below:

FIG. 1 is a perspective view of a nonwoven material of the present invention.

Detailed Description

The present invention generally relates to nonwoven materials which are formed of a blend of fibers needled together into an integral web for subsequent molding into component parts. Referring now to the figures, and in particular to FIG. 1 there is shown an embodiment of the present invention

illustrated as the nonwoven 10, formed of staple fibers 11. The nonwoven 10 has a length direction x, a width direction y, and a thickness direction z. The x direction is typically the machine direction, the y direction is typically the cross machine direction, and the z direction is typically the thickness of the nonwoven 10.

It is preferred that the blend of fibers 11 forming the nonwoven 10 include synthetic polymeric fibers. In one embodiment, the fibers 11 forming the nonwoven 10 include a combination of low melt semi-crystalline polyester sheathed fibers and higher melting polyester fibers. The low melt sheathed polyester fibers have a sheath melting point of from about 130°C to about 165°C. The fibers 11 are typically from about 1 to about 20 denier per filament (DPF), and in one embodiment, the fibers are from about 3 to about 18 DPF. Staple length of the fibers 11 is typically from about 1 to about 4 inches in length, and in one embodiment, are from about 1.5 to about 3.0 inches in length.

In one embodiment of forming the present invention, the combination of fibers 11 are blended in a card, and layered as a web on a belt by a cross lapper. Once layered on the belt, the web of blended polyester fibers 11 is needled at an angle from the z direction of the web in the x-z plane, to lock the fibers 11 together into the integral batting of the nonwoven 10. The web can be needled at an angle of from about 30° to about 60° from the z-axis. In one embodiment, the web is needled at about a 45° angle to the z-axis. The angled needling is usually done in addition to the standard needling, performed parallel to the z axis. By needling the web at an angle from the z-axis in the x-z plane, the nonwoven 10 obtains a greater rigidity to resist sagging in the z axis along the x direction of the nonwoven 10 over webs having a comparable fiber content. It has also been discovered that the use of diagonal needling can allow a reduction in the overall amount of polyester

fibers necessary for the same strength nonwoven web, and correspondingly for the same strength molded component part.

Component parts formed from the nonwoven 10 can be molded into a desired shape by applying temperature and pressure to the component part. The temperature and pressure of the molding process causes the low melt sheath of the low melt sheath fibers to melt and fuse with the high melt fibers and the other low melt sheath fibers. An unexpected result of the present invention, is that an increase in the strength of the nonwoven component part due to angled needling, actually resulted in a greater percentage increase in strength of the molded part than was noticed in the pre-molded nonwoven component part.

Molded parts formed from the nonwoven 10 with the angled needing experience an increased rigidity, giving an increase resistance to sagging. A component part that has been molded from the nonwoven 10 with the angled needling of the present invention, such as an automotive headliner, can obtain an increased rigidity that resists sagging of the nonwoven 10 in the z axis along the x direction on the order of about 25%. Additionally, the nonwoven 10 formed into the component part of an automotive headliner can be rotated to about a 90° angle around the z axis, allowing the x-axis to run essentially across the car, rather than fore-aft. This angled rotation of the nonwoven 10 can improve manufacturing of component parts by facilitating nesting of the component parts in the nonwoven 10 in a manner that takes advantage of the increased rigidity of the nonwoven 10 in the x direction.